Discussion

The United States Patent and Trademark Office has withdrawn the finality of the previous Office Action and accepted the Request for Continued Examination ("RCE") that was filed. The current claims in the application are listed in the Office Action as Claims "17 - 39." However, the Preliminary Amendment, which was filed with the RCE on August 22, 2003, added new Claims 42, 43, 44, which were not considered in this Office Action. The applicants now add new independent Claim 45 and request that each of these claims (42 - 45) be considered.

In the Office Action, the USPTO rejected Claims 17, 23, 24, 26, 29, 30 and 31 - 39 under 35 USC § 102(b) as being anticipated by Ryu, et. al. In addition, the USPTO rejected Claims 17 - 39 under 35 USC § 103(a) as being unpatentable over U.S. Patent No. 2,813,821 ("Updegraff") taken with several articles including Rutkowski, et. al.; Kusnierova, et. al.; and Chaudhury, et. al.; as well as Ryu, et. al. The applicants respectfully traverse each of these rejections.

Rejection under 35 USC § 102.

The USPTO rejected various claims of the application based on Ryu, et. al. This reference teaches a process for the refinement of low grade clay by the removal of sulfur and iron compounds using microbes, particular *t. ferrooxidans.* The refined clay is used

"for manufacturing of structural ceramics." (See abstract.) It is clear that there is nothing in this disclosure concerning the treatment of layer silicates to increase their decolorizing activity for the treatment of oils, fats and waxes. While the Examiner impliedly asserts on page 4 that the ultimate use for the product is not relevant to its patentability, a person skilled in the art attempting to discover a process for increasing the decolorizing activity of a layer silicate for the treatment of oils, fats and waxes (the stated purpose of each claim) would never look to a reference such a Ryu, et. al. for such a process, as Ryu, et. al. merely teaches a process for improvement of structural ceramics, a utilization far removed from that of the art claimed in the application.

More importantly, the process disclosed in Ryu, et. al. is not the same process that is claimed in the application. All claims of the application, as amended, mandate that the layer silicate, prior to treatment, must have a pH greater than 3.4. (In fact, clays of the type claimed typically have a pH of about 5 to 9 or so.) The clay is then treated with an acid-producing microorganism until the pH value of the treated clay is reduced to not more than 3.4. In contrast, the pH of the clay of Ryu, et. al. has already been reduced to 2.0 by the addition of sulfuric acid before it is ever treated with microorganisms. As stated by Rye, et. al.,

The initial pH of the medium was adjusted to 2.0 using 0.1 H_2SO_4. The medium was inoculated with 5 ml of the pyrite-adopted cells (10^9 cells/ml). (Page 47, col. 1, lines 21 - 24) See also Ryu, et. al., page 47. col. 1, lines 4 - 6.

Thus, the process disclosed in Ryu, et. al. requires the following steps: a) crushing the clay to sizes smaller than about 5 mm (page 46, col. 2, six lines from the bottom); b) treating the clay with the MS medium, the pH of which has been adjusted to 2.0 by the addition of sulfuric acid (page 47, col. 1, lines 4 - 6 and 21 - 22); and c) adding the microorganism to the acid-treated clay (page 47, col. 1, lines 22 - 24). Thus, the pH of the clay has already been reduced to 2.0 well before it is treated with the microorganisms. Only after the pH of the clay has already been adjusted down to a pH level well below that claimed in each of the claims of the application is the microorganism added.

In contrast, the pH of the clay in the process of the invention at the time of treatment with the microorganisms is far above 3.4. The applicants surprisingly discovered that the acid produced by the microorganisms drops the pH of the clay to below 3.4. This fact was never appreciated or taught by Ryu, et. al.

Thus, there is a significant difference between the process taught by Ryu, et. al. and the process that is claimed. Ryu, et. al. requires the addition of acid to the clay to bring the pH level of the clay down to about 2.0. Only after this low pH is reached are the microorganisms added to the clay. In the claims of the

application, the microorganisms are added to the clay when the clay has a pH far above 3.4. In addition, in contrast to Ryu, et. al., no acid is required to be added to the clay at any stage of the process of the application. Accordingly, a person skilled in the art reviewing the teaching of Ryu, et. al. would be taught to add the microorganisms to the clay only after the clay is pretreated with acid. In fact, a person skilled in the art reviewing the teaching of Ryu, et. al. would understand that the clay must be first treated with a strong inorganic acid to lower its pH to a level where the microorganisms can act on the clay to remove the sulfur and iron compounds. Accordingly, a person skilled in the art would not be taught the process claimed in the claims of the application. The applicants respectfully request that this rejection be withdrawn.

Rejection under 35 USC § 103.

The primary reference cited for the rejection under 35 USC § 103 is U.S. Patent No. 2,813,821 ("Updegraff"). This reference discloses a process for the treatment of a porous material with a microorganism to create a network of channels formed on the interior of the porous material. Col. 1, lines 61 - 67. There are several significant deficiencies in the combination of this reference with any of the cited references, some of which are even acknowledged by the USPTO.

1. The material which is treated with the microorganism in Updegraff is not a "layer silicate", as defined in the application. The layer silicate of the application is described in the fourth paragraph on page 3 as follows:

> [i]n accordance with a preferred form of embodiment in accordance with the invention, the layer silicate is a three layer silicate, e.g. a naturally occurring smectite clay, especially a bentonite clay or palygorskite clay or mixtures thereof.

In the last paragraph on that same page, is a discussion of palygorskite clays which are among the layer silicate disclosed in the application.

In contrast to these layer silicates, the "porous material" of Updegraff is defined as:

> metallic oxide catalysts such as natural or synthetic activated silica, activated alumina, and activated silica-alumina. (Col. 2, lines 40 - 43)

The porous materials of Updegraff are utilized as carriers for catalysts. These materials are not the same as the "layer silicates" that are claimed in the application. In addition, none of the cited articles teach or suggest that "layer silicates" would be preferred over the materials of Updegraff. In fact, Updegraff teaches away from the use of any type of material for his "porous materials" other than what is specifically disclosed.

The USPTO asserts that Updegraff "clearly suggests that other porous materials that are regularly employed during absorption

procedures, including conversions of hydrocarbons, can be treated with microorganisms and improved with regard to their porosity or absorbent capacity/activity." No person skilled in the art would confuse a material that was designed for use as "a catalyst employed in the conversion of hydrocarbons" (col. 2, lines 37 - 38) with an activated layered silicates used to decolorize oils.

2. There is also no teaching in Updegraff that the pH of the porous material must be greater than 3.4 prior to treatment with the microorganisms and then must be below 3.4 after treatment with the acid-producing microorganism. It can not even be assumed that the pH of the material of Updegraff would ever drop to a level below 3.4 after treatment with microorganisms as there is no requirement in Updegraff that the microorganisms be "acid-producing". (Note that none of the other cited articles teach or suggest that acid-producing microorganisms must be used.) In fact, Ryu, et. al. suggests that acid-producing microorganisms would not even be necessary because an organic acid has already been added to the material to lower its pH to 2.0 before the microorganisms are even added.

3. Even the USPTO accepts that "[t]he teaching of the cited patent U.S. 2,813,821 is not particularly clear with respect to the decolorizing activity of final porous materials having the improved/increased surface to volume ratio." (Page 5, last three lines.) In fact, there is no teaching in Updegraff of any process

for increasing the decolorizing activity of a layer silicate by treatment of that layer silicate with acid producing microorganisms. Thus, a person skilled in the art reviewing the teaching of Updegraff would not utilize its teachings to increase the decolorizing activity of a material, which is not even disclosed in Updegraff.

4. The USPTO states that some, though not all of these deficiencies in Updegraff, are overcome by the other cited references. In particular, the USPTO states that Rutkowski, et. al. demonstrates that it is known that the decolorizing power of clay is improved by increasing its surface area. Whether this is true or not is irrelevant. The disclosure of Rutkowski, et. al. is a short abstract concerned with the decolorizing of crude oil, utilizing activated carboniferous montmorillonite. This reference teaches the importance of transient pores for this use. There is no indication that these pores are induced by microbial activation. In fact, Rutkowski, et. al. state that clay activation is produced using strong inorganic acids such as, sulfuric, hydrochloric and nitric acids. Further, Rutkowski, et. al. state that the most efficient method of activation is by leaching the clay with a 20% sulfuric acid solution followed by calcination at 773°K for three hours. A person skilled in the art reviewing Rutkowski, et. al. in combination with Updegraff would not be taught that a layer silicate should be treated with acid-producing microorganism

(rather than strong inorganic acids) to produce a pH level for the layer silicate lower than the claimed level, in order to increase its decolorizing activity.

5. The USPTO also asserts that

> [o]ne of skill in the art would have been motivated to treat clays with microorganisms under acidic conditions or until acidic conditions are about 3.4 or below because those acidic conditions are the growth requirement of microorganisms including *Thiobacillus* or *Aspergillus* that have been used for clay degeneration and/or destructuring.(Page 7, lines 17 - 21)

On that same page, the USPTO asserts that Ryu, et. al. teaches "...that the clays are treated by *Thiobacillus* until pH is no more than 3.4 (Fig. 6)." In fact, the USPTO has incorrectly read Ryu, et. al. As stated above, the process that is disclosed in Ryu, et. al. requires pretreatment of the clay with sufficient sulfuric acid to reduce its pH to 2.0 prior to inoculation of the clay with the microorganisms. (See page 47, col. 1, lines 5 -7 and 21 - 24.) What is taught by Ryu, et. al. is that the microorganisms work best when the pH of the clay has already been reduced to about 2.0 before addition of the microorganisms. This is entirely different from what is claimed in the application. The claims of the application teach that the microorganisms themselves produce acid which reduces the pH of the clay from its normal pH of about 7 or so, as shown in Tables I and II, to a pH of less than about 3.4 after the activation with the microorganisms.

The USPTO has a basic misunderstanding of the applicants' process. The USPTO assumes that the best growth requirement

condition for the bacteria are when the acid level is 3.4 or below. In fact, each of the references, if it teaches pH at all, teaches that the pH of the clay must first be reduced to 3.4 or below prior to treatment with the microorganism. This is shown in Ryu, et. al. at page 47, col. 1, lines 21 - 24; Rutkowski, et. al. lines, 4 - 7; Chaudhury, et. al., page 211, col. 2, lines 5 - 9 ("The initial pH of the lixiviant was also varied from 0.5 to 2.0. It was observed that beyond pH of 2.0, the iron dissolution rate was very less due to precipitation of iron because the pH was = 3.0.") ("The pH of the culture filtrate was adjusted by addition of diluted HCl.) Page 210, col. 2, lines 14 - 16." "*Aspergilus niger* culture filtrate in presence of hydrochloric acid removes iron from china clay." (Abstract)) No pH is disclosed in Kusnierova, et. al. or in Updegraff.

In contrast, the primary purpose of use of the microorganisms in the claims of the application is to reduce the acid level of the clays to a level of 3.4 or below, a process not taught by Ryu, et. al. or any of the other references.

7. The USPTO has rejected these claims based on 35 USC § 103 obviousness. To establish a *prima facie* case of obviousness, three basic criteria must be satisfied by the USPTO. First, there must be some suggestion or motivation in the references to teach one of ordinary skill in the art to modify the references or combine the reference teaching to produce the invention, as claimed. Second,

there must be a reasonable expectation of success. Finally, the prior art references must suggest all the claim limitations. The combination of Updegraff with Rutkowski, et. al. fails to show any motivation to combine these references as they are for entirely different areas of the art. Further, even if these references were combined, all of the elements of the claims are not taught. Neither reference teaches the treatment of "layer silicates". The material in Rutkowski, et. al. is an activated carboniferous clay, while the material of Updegraff is a metallic oxide catalyst, activated alumina or activated silica-alumina, materials far different from the claimed materials. Further, there is nothing in either reference which teaches the treatment of a layered silicate with an acid producing microorganism to drop the pH of the layered silicate from a level above 3.4 to a level below 3.4. Accordingly, this combination is also not appropriate.

The USPTO further cites Kusnierova, et. al. and Chaudhury, et. al. While both of these references teach the combination of a microorganism with a clay material, neither teaches the use of a layer silicate which has a pH greater than 3.4 or treatment with an acid producing microorganisms until the pH level of the layer silicate is reduced to less than 3.4. Further, neither discloses that this process will increase the decolorizing activity of a layer silicate for the treatment of oils, fats and waxes.

In addition, the combination of these references with Ryu, et.

al. does not teach the invention. In addition, there is no teaching or suggestion in any of the references that such combination would be appropriate because of the vast differences in the fields of endeavor of these references. For example, Ryu, et. al. teach the use of microbes for the removal of pyrite from low grade clay for the production of structural ceramic and Kusnierova, et. al. teach that soil bacteria may be catalyzers of bentonite.

The applicants therefor request that the rejection based on 35 USC § 103 be withdrawn.

New Claim 45

The USPTO has acknowledged that none of the references teach acid-producing microorganisms acting on layer silicates to reduce its pH to a level below a set figure to produce a product useful for increasing the decolorizing activity of the layer silicate for the treatment of oils, fats and waxes. Accordingly, the applicant has added new Claim 45 claiming a process for the treatment of oils, fats and waxes comprising treating the layer clay with an acid-producing microorganism. This claim specifically includes as an element, the treatment of oils, fats and waxes with an activated layered silicate. This claim is clearly not disclosed by any of the references cited alone or in combination and is thus allowable over all references cited.

CONCLUSION

The applicants believe they have responded to all allegations of the Office Action. Further, the applicants assert that all claims of the application are allowable over the prior art. If there are questions concerning this Amendment, please contact applicants' counsel.

Respectfully submitted,

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